

# Injury in Kampala, Uganda: 6 years later

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**Background:** Trauma remains a tremendous cause of morbidity and mortality in most countries. The objective of our study was to describe injury from trauma at the major referral hospital in Uganda over a 1-year period.

**Methods:** Trauma registry forms have been completed for all trauma patients seen between August 2004 and July 2005 at the casualty department of Mulago Hospital in Kampala, Uganda. We also obtained 2-week follow-up data, and we compared these data with 1998 data from the same institution.

**Results:** In all, 3778 patients were entered into the database, with complete data available for 93.5% of patients. Patients had a mean age of 26 (standard deviation [SD] 12) years, and 75% of patients were male. The mean Kampala Trauma Score (KTS) was 9.1 (SD 1). We classified injuries as mild (82%; KTS 9–10), moderate (14%; KTS 7–8) and severe (4%; KTS ≤ 6). On arrival, 57% of patients were treated and sent home, 41.6% were admitted and 0.4% died in the casualty department. At 2-week follow-up, 85% were discharged, 12% were still in hospital and 2.7% had died. Causes of injury included road traffic collisions (50%), blunt force (15%), falls (10%), stab wounds (9%), animal bites (7%), burns (6%) and gunshot wounds (1%). Causes of mortality were road traffic collisions (61%), burns (15%), blunt trauma (8.6%), falls (6.5%), stabs/cuts (5.4%) and other (3.3%). Data from 1998 demonstrated a similar spectrum of injuries but with a mortality of 7.2%.

**Conclusion:** Road traffic collisions are the greatest cause of morbidity and mortality from injury in Kampala, Uganda. When comparing data from 1998 and 2005, the spectrum of injury remained similar, but mortality decreased from 7.2% to 2.7%.

**Contexte :** Le traumatisme demeure une cause importante de morbidité et de mortalité dans la plupart des pays. Notre étude visait à décrire les blessures causées par des traumatismes et traitées dans les principaux hôpitaux de référence en Ouganda au cours d'une période d'un an.

**Méthodes :** On a rempli des formulaires du registre des traumatismes pour tous les patients traumatisés accueillis entre août 2004 et juillet 2005 au service de traitement des blessés de l'Hôpital Mulago de Kampala, en Ouganda. Nous avons aussi obtenu des données de suivi sur 2 semaines et nous avons comparé ces données avec les données de 1998 provenant du même établissement.

**Résultats :** Au total, on a inscrit 3778 patients dans la base de données; des données complètes étaient disponibles pour 93,5 % des patients. Les patients avaient en moyenne 26 (écart-type [ET] 12) ans, et 75 % étaient de sexe masculin. La moyenne du score des traumatismes de Kampala (STK) s'établissait à 9,1 (ET 1). Nous avons classé les blessures comme légères (82 %; STK 9–10), moyennes (14 %; STK 7–8) et graves (4 %; STK ≤ 6). À l'arrivée, 57 % des patients ont été traités et renvoyés chez eux, 41,6 % ont été hospitalisés et 0,4 % sont morts au service de traitement des blessés. Au suivi à 2 semaines, 85 % avaient obtenu leur congé, 12 % étaient encore à l'hôpital et 2,7 % étaient morts. Les causes de blessure incluaient les accidents de la circulation (50 %), les traumatismes contondants (15 %), les chutes (10 %), les plaies causées par arme blanche (9 %), les morsures d'animal (7 %), les brûlures (6 %) et les blessures par balle (1 %). Les causes de mortalité incluaient les accidents de la circulation (61 %), les brûlures (15 %), les traumatismes contondants (8,6 %), les chutes (6,5 %), les plaies par arme blanche ou coupures (5,4 %) et les autres causes (3,3 %). Les données de 1998 ont démontré un éventail semblable de blessures, mais un taux de mortalité de 7,2 %.

**Conclusion :** Les accidents de la circulation constituent la principale cause de morbidité et de mortalité attribuables à des blessures à Kampala, en Ouganda. Lorsque l'on compare les données de 1998 à celles de 2005, l'éventail des blessures demeure semblable, mais la mortalité passe de 7,2 % à 2,7 %.

In the past century, there has been a substantial shift in the causes of death in both developed and developing nations.<sup>1</sup> Deaths from infectious diseases have decreased, whereas deaths from injury have increased to the point that injury is one of the leading causes of death in many developing countries.<sup>2</sup> Furthermore, injury has become one of the leading causes of global adult mortality and disability-adjusted life year (DALY) losses.<sup>3</sup> It currently accounts for 14% of global DALY losses, and this is likely to increase to 20% by the year 2020.<sup>2</sup> Furthermore, the World Health Organization (WHO) has predicted a 40% increase in global deaths owing to injury between 2002 and 2030. Road traffic deaths are predicted to increase from 1.2 million in 2002 to 1.9 million in 2020 globally, to become the third leading cause of DALY losses.<sup>4</sup> This will be caused predominantly by an increasing number of road traffic deaths associated with economic growth in low- and middle-income countries.

Thus developing nations will experience large increases in morbidity and mortality from injury. Despite these projections, limited attention is given to this problem. This is especially true in low-income countries where international attention is focused more on the morbidity and mortality that results from infectious diseases, particularly HIV/AIDS. This situation is particularly true in Uganda. Although there are a large number of nongovernmental organizations and international relief agencies in Uganda, few have a mission dedicated to decrease morbidity and mortality related to injury. Trauma care in Uganda is also limited by the lack of a structured prehospital emergency care program. Trauma patients are often brought in by friends, relatives, witnesses or the police.<sup>5</sup> Compounding these problems is a lack of injury event data to further evaluate the scope of the problem.

One organization that does have a mission to reduce trauma mortality in Uganda is the Injury Control Centre in Uganda (ICC-U). It was created in 1996 and is a non-government, not-for-profit organization evaluating injury prevention. Since its inception, it has been involved in numerous injury-prevention and management projects. These include programs such as Trauma Team Training (TTT) to train teams of personnel to manage injured patients, first-aid training, visibility projects to improve visibility on the roads, peace building and child safety. The ICC-U has also been instrumental in instituting trauma registries in Uganda.

Trauma registries are a useful way of describing patterns of injury in a hospital setting. These registries provide unique demographic and outcome data. Using these data, it is possible to identify trends in injury and, in so doing, design prevention programs and further modify and improve existing programs. However, the information from these registries is limited to patients who access care and to the catchment area of the registry.

Trauma data have recently been collected at Uganda's

major referral hospital, Mulago Hospital, over a 1-year period between 2004 and 2005. The objective of our study was 2-fold: to summarize the registry data at Mulago hospital in Uganda during this time period and to compare these results with data obtained from the same institution in 1998.

## METHODS

Our study is a review of prospectively collected data for the 1-year period of August 2004–July 2005. Inclusion criteria were injured patients of any age presenting to the casualty department. A trauma registry form was completed for all trauma patients triaged at Mulago Hospital. Mulago Hospital is a 1500-bed hospital and is the largest national referral, teaching and research hospital in the country. The trauma registry form is a standardized form that has already been described elsewhere.<sup>6,7</sup> In brief, it is a 1-page sheet completed by a trained health worker in the hospital during the patient's initial presentation to the casualty department. Basic demographic characteristics, nature and cause of injury, vital signs and outcome data are recorded. Two-week follow-up data are also obtained for admitted patients.

We determined severity of injury by calculating the Kampala Trauma Score (KTS) from data in the trauma registry. This tool is reliable and valid in both adults and children and has been designed to be calculated easily and efficiently in a resource-poor environment.<sup>5</sup> It compares favourably with other trauma scoring systems such as the Revised Trauma Score (RTS) and Injury Severity Score (ISS).<sup>8</sup> It is scored based on age, number of serious injuries, systolic blood pressure, respiratory rate and neurologic status on presentation. Initially, it was scored on a scale of 5–16. A severe injury consisted of a KTS less than 11, a moderate injury 11–13 and a mild injury 14–16. The KTS was then modified in 2004 to a range of 0–10. Although the parameters were maintained, the scoring of all the parameters except for blood pressure were given 1 score lower. Thus, mild injuries have a KTS of 9–10, moderate 7–8 and severe 6 or less.

We summarized and analyzed these data and then compared them with 1998 data from the same hospital that were subsequently published in 2002.<sup>9</sup>

## RESULTS

In all, 3778 patients were entered into the database, with complete data available for 93.5% of patients. Patients had a mean age of 26 (standard deviation [SD] 12) years, and 75% were male. The mean Kampala Trauma Score (KTS) was 9.1 (SD 1). We classified injuries as mild (82%), moderate (14%) and severe (4%). On arrival, 57% of patients were treated and sent home, 41.6% were admitted to hospital and 0.4% died in the casualty department. At 2-week follow-up, 85% were discharged, 12% were still in hospital and 3% had died or run away.

Box 1 demonstrates causes of mortality and morbidity as well as nature and location of injury for the study population. Fifty percent of injuries were caused by road traffic collisions, which were responsible for 61% of patient deaths. The most commonly recorded injury was a cut, bite or open wound (38%), and the most commonly injured area was the head, neck or face (44%). Table 1 demonstrates the top causes of morbidity and mortality with accompanying KTS scores, broken down by age group. There were 91 deaths for an overall mortality of 2.7%. Two patients were dead on arrival, 14 died in the casualty department and 75 died after admission to hospital.

Table 2 compares our data with those from 1998.<sup>9</sup> Although demographics and causes of morbidity and mortality were similar, injury severity was greater in our study population. Figure 1 demonstrates that mortality decreased in our study population from 7.2% in 1998 to 2.7% in 2005.

## DISCUSSION

Through a combination of improved treatment and injury-prevention programs, injury mortality rates have decreased in many high-income countries.<sup>10</sup> The first step in developing such programs, however, is to obtain reliable data for prevalence of injury. Once this information is obtained, targeted population- and location-specific injury prevention strategies can be developed and implemented. After these programs are in place, it is necessary to re-evaluate the outcomes at regular intervals to assess the success of these programs.

A major impediment to the development of appropriate injury-prevention programs in low-income countries is the lack of information on injury. Kobusingye and colleagues<sup>9</sup> described injuries at 5 major hospitals in Uganda in 1998.

This work concluded that injury (and in particular road traffic collisions) were a major cause of morbidity and mortality in Uganda, especially in young men. We chose to re-examine

### Box 1. Spectrum of injury

#### Causes of injury

- 50% road traffic collision
- 15% blunt force
- 10% fall
- 9% stab/cut
- 7% snake/animal bite
- 6% burn
- 3% other

#### Causes of mortality

- 61% road traffic collision
- 15% burns
- 9% blunt force
- 7% falls
- 5% stabs/cuts
- 1% gunshot
- 2% other

#### Nature of injury

- 38% cut, bite, open wound
- 26% bruise, superficial injury
- 20% fracture
- 6% concussion
- 5% strain, sprain, dislocation
- 3% internal organ injury
- 2% other

#### Location of injury

- 44% head, neck, face
- 39% bony pelvis, extremities
- 9% abdomen/pelvis/perineum
- 7% chest
- 1% spinal cord

**Table 1. Top causes of mortality and injury among patients presenting to the casualty department of Mulago Hospital in Kampala, Uganda, during our study period**

Age group, yr	No. patients (%)	KTS, mean (SD)	Mortality, %	Top 3 causes of death (%)	Top 3 causes of injury, %
0–5	234 (6.9)	7.5 (2)	5.1	Burns (50) RTC (25) Blunt (17)	RTC (48) Fall (13) Blunt force (10)
6–15	484 (14.4)	9.1 (1)	12.9	RTC (64) Burns (14) Fall (14)	RTC (53) Fall (11) Stab/cut (9)
16–25	1087 (32.3)	9.4 (1)	2.4	RTC (42) Fall (15) Stab/cut (12) Blunt (12)	RTC (62) Gunshot (17) Stab/cut (10)
26–35	1056 (31.3)	9.4 (1)	2.4	RTC (56) Gunshot (20) Stab/cut (12)	RTC (46) Gunshot (16) Stab/Cut (9)
36–50	443 (13.1)	9.3 (1)	2.7	RTC (67) Gunshot (17) Landmine (8) Fall (8)	RTC (48) Gunshot (15) Landmine (13)
> 50	65 (1.9)	8.9 (1)	3.1	RTC (100)	RTC (54) Falls (14) Gunshot (12)

KTS = Kampala Trauma Score;<sup>5</sup> RTC = road traffic collision; SD = standard deviation.

data from Uganda 6 years after this initial study.

Perhaps the most startling result from this study is the dramatic decrease in mortality observed at Mulago Hospital between the 2 time periods. Mortality decreased in a 6-year period by 62.5% from 7.2% in 1998 to 2.7% in 2005. This occurred in spite of the fact that there was a higher percentage of moderate to severely ill patients (18% v. 3%), as measured by the KTS. The cause of this decrease cannot be examined with the data from this trauma registry and is unfortunately beyond the scope of our study. However, it is quite possible that injury-prevention programs (such as improved visibility) and improved prehospital and hospital care (such as improved first-aid training and TTT) might have played a role. This demonstrates that one is able to impact mortality with the development of region- and population-specific programs targeting particular health problems. These kinds of programs should be implemented elsewhere and expanded. Further research to identify these programs is necessary.

Our study also demonstrates that further attention needs to be focused on preventing burn injuries, since this was a major cause of mortality, particularly in the pediatric population. Furthermore, mortality from burns increased from 8% in 1998 to 15% in 2005. Many of these burn injuries were the result of children being left alone by a fire or stovetop. Programs aimed at educating mothers about fire safety might prove beneficial.

Our data demonstrate a much higher prevalence of severe and moderate injuries. Data from 1998 reported only 3% of patients with KTS in the severe and moderate

range, whereas in 2005 this same category represented 18% of patients presenting to the casualty department. This indicates that more severely injured patients are presenting to hospital. This increase in severity may be because of improvements in prehospital and ambulance care allowing for sicker patients to reach hospital. Another possibility is the change in the scoring system of the KTS from a scale of 16 to a scale of 10. Perhaps the revised scale allows for better separation of moderate and severe injuries from minor injuries. Further studies are needed to assess whether the 2 KTS scores are directly comparable.

Our study has some important limitations. First, we were unable to determine the total number of patients that presented to the casualty department during the study period. We therefore have no way of knowing the capture rate for the trauma registry during this time period. Previous work has shown that trauma registries capture about 60% of patients who come to hospital.<sup>11</sup> Second, it is not possible to know and report on how many patients were injured and did not present to hospital. Our data likely under-represent the scope of the problem, since it is likely that the sickest patients and those already dead did not make it to hospital. Third, because Uganda is such a diverse country with varied terrain and infrastructure, these results are limited to the population living in and around Kampala and cannot be extrapolated to the rest of the country. Finally, there is also a possible selection bias since we analyzed data from only 1 hospital (albeit the largest in the country and the major referral centre).

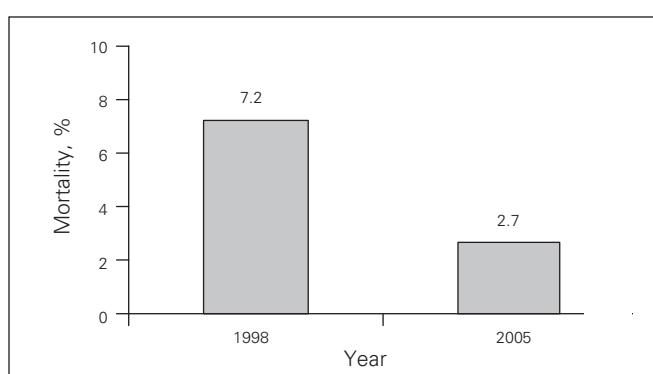
In conclusion, trauma registry data that compared mortality from injury at Mulago Hospital between 1998 and 2005 demonstrated a 62.5% decrease from 7.2% in 1998 to 2.7% in 2005. Further research needs to be undertaken to better identify the reasons for this decrease. Once programs that have resulted in improved survival are identified they can be further assessed and expanded. Furthermore, such programs could then be implemented in other developing countries. Continued support for organizations such as the Injury Control Centre in Uganda is needed.

**Competing interests:** None declared.

**Table 2. Comparison of demographic and clinical data of patients presenting to the casualty department of Mulago Hospital in Kampala, Uganda in 1998 and 2005**

Variable	Year, % *	
	1998	2005
No. of patients	2531	3778
Mean age, yr	24	26
Male sex	73.0	75.0
Severity		
Severe	1.0	4.0
Moderate	2.0	14.0
Mild	97.0	82.0
Causes of injury		
Traffic	50.0	50.0
Cut/stabs	16.0	9.0
Falls	13.0	10.0
Blunt	7.0	15.0
Causes of mortality		
Traffic	54.0	61.0
Cut/stabs	11.0	—
Falls	11.0	7.0
Blunt	—	9.0
Burns	8.0	15.0
Mortality	7.2	2.7

\*Unless otherwise indicated.



**Fig. 1. Trauma registry data mortality (%): 1998 versus 2005.**

**Contributors:** Drs. Demyttenaere and Lett designed the study. Drs. Nansamba and Nganwa and Mr. Mutto acquired the data, which Drs. Demyttenaere and Razek and Mr. Mutto analyzed. Drs. Demyttenaere and Lett wrote the article, which Drs. Demyttenaere, Nansamba, Nganwa and Lett and Mr. Mutto reviewed. All authors approved publication.

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